A "NEW" SIGNATURE FOR SPHERICAL NUCLEI: SENIORITY CONSERVING TRANSITIONS

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Nuclear structure studies using fusion evaporation reactions for $Z > 82$ are hindered by the strong competition with fission. At Yale a new gas-filled magnetic spectrometer, SASSYER, is used to select recoils produced in heavy-ion fusion-evaporation reactions. A new physics program, investigating nuclei with $Z > 82$ and $N < 126$, has successfully begun.

Near $N = 126$, the even-even nuclei in this mass region have 8^+ isomers based on the $\pi h_{9/2}{}^n$ configuration. These isomers are well known in Po ($Z = 84$) and Rn ($Z = 86$), and we have recently extended the systematics in the heavier Ra ($Z = 88$) isotopes. Nuclear structure studies with SASSYER and the recent Ra results will be discussed.

An examination of the B(E2; $8^+ \rightarrow 6^+$) values as a function of Z in this mass region shows a dramatic difference from the yrast B(E2; $8^+ \rightarrow 6^+$) trends in collective nuclei, as well as from the B(E2; $2^+_1 \rightarrow 0^+_1$) values known throughout the chart of nuclei. The B(E2; $8^+ \rightarrow 6^+$) values in the Po-Rn-Ra nuclei *decrease* as a Z moves away from magic, rather than increase as would be expected for an increase in collectivity with valence nucleon number.

The observed difference is attributed to the role of seniority (ν) in the Po-Rn-Ra nuclei. For collective nuclei, B(E2) values increase with spin and valence nucleon number, exhibiting a $\cap$-shaped parabolic trend across a major shell. Conversely, B(E2) values for $J_i > 2$ in seniority-dominated (near-spherical) nuclei decrease with increasing spin, and for $\Delta\nu = 0$ transitions exhibit a $\cup$-shaped parabolic trend as the j-shell is filled. The contrasting behavior between seniority-dominated and collective regimes provides a new signature of near-closed-shell, single-j configurations [1]. This is especially useful in exotic nuclei where the locations of magic numbers and the evolution of underlying shell structure are key issues of current and future concern.

The above trend in B(E2) values for seniority conserving transitions has been observed in many semi-magic and near-semi-magic regions. A brief overview of the seniority-conserving and non-conserving transitions in these regions will be provided. In addition, the potential use of the $\Delta\nu = 0$ transition probability as a structural tool will be described.

[1] J. J. Ressler *et al.,* Phys. Rev. C **69**, 034317 (2004).